

REMARKS

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the reference character 60a which is not mentioned in the description as originally filed. Applicants' attorney has reviewed the specification and determined the location at which the reference character 60a should have been placed, and has requested that the original paragraph be replaced with a new paragraph which does refer to character 60a. In view of this correction, the Examiner is respectfully requested to withdraw the objection to the drawings under 37 CFR 1.84(p)(5).

The disclosure is objected to in view of formalities with respect to the paragraph beginning at page 1, line 3 of the application, which paragraph pertains to related U.S. applications. This paragraph has been updated to refer to the relationship between the present divisional application and its issued parent application, and to refer to the specific U.S. serial number of a related application which was filed concurrently with the issued parent application previously mentioned. Applicants have requested that the original paragraph be replaced by the updated paragraph. In view of this correction, the Examiner is respectfully requested to withdraw the objection to the Specification disclosure.

Claim 53 has been cancelled without prejudice. New Claim 60 has been added to facilitate the requirements of multiple dependency claiming.

Claim Rejections Under 35 USC § 102

Claims 24, 53, and 55 - 57 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,827,138 to Randall. The Examiner argues that Claim 24 is a product-by-process claim, and is only limited by the structural features recited and not the method of making the structure. Applicants have amended Claim 24 so that this claim recites the structure produced when the method is carried out. Applicants have also included particular limitations

with respect to the structure, where these limitations are provided in the application Specification as originally filed, at Page 1, lines 29 - 38, continuing at Page 2, lines 1 - 6.

Claim 53 has been cancelled without prejudice, and the preamble and a portion of the claim language of Claim 53 have been inserted into Claims 54 and 55 which previously depended from Claim 53.

Applicants respectfully contend that the electron beam lithography mask assembly of amended Claim 24, and the temporary structure useful in the fabrication of an electron beam lithography mask which is claimed in amended Claims 55 - 57 is not anticipated by or made obvious by the disclosure in the Randall reference. The Randall reference describes a mask which is particularly useful in parallel-printing ion beam lithography. The mask is a relatively rigid screen constructed from a relatively rigid material, such as monocrystalline silicon, with meshes formed through the screen over the entire area of the screen. A less rigid filler material is present in non-transmissive areas of the mesh. (Abstract and Col. 3, lines 5 - 15.) The size of the mask is said to be approximately one cm². (Col. 4, lines 14 - 18.)

Applicants' invention as claimed in amended Claim 24 is to a mask assembly for use in electron beam lithography which contains a plurality of open windows, with a mask overlying, parallel to, and supported by a major surface of the windowed substrate, where the mask assembly width and length dimensions are each several inches on a side. Applicants' mask assembly has no filler present in the windowed substrate, which acts only as a support structure. The pattern is generated when electron beam radiation passes through a patterned mask which is supported by the support structure. This is in contrast with the filled grid mask described in the Randall reference, which is evidently less than about 0.4 inches on a side, where the pattern transferred from the mask is determined by which areas of the grid have filler material in them and which do not. The Randall reference does not teach a mask which anticipates applicants' invention and there is nothing in the Randall reference which renders applicants' invention

obvious. The Randall reference describes a different kind of mask which functions in a distinctly different manner from applicants' mask.

Applicants' invention as claimed in amended Claims 55 -57, pertains to a temporary structure which is useful in fabrication of an electron beam lithography mask. The temporary structure comprises a mask layer overlying a grid structure comprising a plurality of windows which are filled by a support structure. This is in contrast with the Randall reference mask structure, where there is no overlying mask layer, because the mask is the grid itself where the pattern is determined by which portion of the grid is filled with a filler. The temporary Randall mask fabrication structures are also different because they do not have a separate mask layer overlying the grid structure.

In view of the above distinctions, the Examiner is respectfully requested to withdraw the rejection of Claims 24, 53, and 55 - 57 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,827,138 to Randall.

Claims 24, 53, and 55 - 57 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,168,890 to Takahashi.

As mentioned above, Claim 53 has been cancelled without prejudice. Applicants respectfully contend that amended Claims 24 and 55 - 57 are not anticipated nor rendered obvious by the Takahashi reference. The Takahashi reference pertains to masks which include a support member which supports a membrane where the membrane itself defines the mask pattern. In applicants' claimed mask assembly or temporary structure used to fabricate the mask assembly, the membrane is a supporting structure only which is transmissive to electrons and it is a patterned masking layer overlying the supporting membrane which determines where electrons will be transmitted through the mask.

The focus in the Takahashi reference is on the use of an impurity dopant in the mask membrane which provides stability for the mask membrane to overcome the effects of processing

the membrane mask at temperatures in the range of 1,000 °C to about 2000 °C. The atomic radius of the dopant is less than the atomic radius of silicon atoms of the membrane, so that tension is said to arise in the neighboring silicon atoms, generating a tensile stress in the mask substrate. This is said to overcome the compressive stress which occurs during the thermal fusion of the silicon membrane to the support structure. (Abstract; Col. 3, lines 52 - 58; Col. 4, lines 39 - 41; and Col. 6, lines 3 - 18 and 30 - 36.)

Applicants are not concerned with the build up of compressive stresses due to high temperature fusion bonding of the various elements of the structure to form the mask assembly including support structure. As can be seen by looking at several of applicants' dependent claims, the chemical composition of the various materials used by applicants in the mask assembly and support structure and the dimensions and shape of the support structure are different than described in the Takahashi reference.

One skilled in the art reading the Takahashi reference would not be led to the overall mask assembly with support structure which is described and claimed by applicants. The Takahashi reference describes a structure in which a silicon layer which contains the pattern to be transferred by the mask is fusion bonded at high temperature to an underlying silicon support layer by a silicon oxide fusing layer. The patterned silicon layer, which is referred to as a thin silicon layer or as the mask membrane, is diffused with an impurity to provide a tensile stress within the mask membrane. (Col. 5, lines 47 - 58; Col. 6, lines 30 - 37; Col. 6, lines 55 - 59; Col. 7, lines 11 - 19; and Col. 7, lines 59 - 67, continuing at Col. 8, lines 1 - 2, for example) There is no mention of a supporting membrane layer which overlies the support structure and which transmits all impending radiation, with a patterned mask layer overlying the supporting membrane layer, as described and claimed by applicants. The Takahashi reference leads away from applicants' inventive structure, by teaching a different, alternative structure.

In view of the above distinctions, applicants respectfully request that the Examiner withdraw the rejection of Claims 24, 53, and 55 - 57 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,168,890 to Takahashi.

Claims 24 and 47 - 60 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5, 899,728 to Mangat et al.

Applicants respectfully contend that the disclosure in the Mangat et al. reference does not anticipate nor render obvious applicants' invention as claimed in amended Claims 24 and 47 - 60. The Mangat et al. reference describes a very complicated process for producing a mask structure of the kind shown in Figures 3 and 3A, for example. The final structure shown in Figure 3 includes a pattern scattering layer 240 overlying an etch stop layer 230, which is typically a metallic layer, overlying a membrane material which is used in combination with scattering layer 240, overlying a second substrate or base 210, overlying a first layer 320. The final structure shown in Figure 3A includes the same layers as shown in Figure 3, but produced by a different process. Other similar structures are described with reference to different figures in the Mangat et al. disclosure.

The use of the mask structure shown in Figures 3 and 3A is shown in Figure 4. A description of the compositions of the various layers in Figure 3 is presented at Col. 4, lines 21 - 67, continuing at Col. 5, lines 1 - 15. A description of the compositions of the layers in Figure 3A is presented at Col. 5, lines 16 - 67, continuing at Col. 6, lines 1 - 42. What is important here is that due to the process by which the Mangat et al. masking structure is made, a number of layers which are not present in applicants' structure are required. Further, there is no description of the kind of windowed support structure which is described and claimed by applicants. With reference to applicants' amended Claim 24, for example, the masking layer is directly overlying the membrane support layer. In the Mangat et al. structure, the scattering layer is deposited

directly overlying an etch stop layer which is present between the scattering layer and an underlying membrane material.

With respect to amended independent Claim 47, the windowed support structure is recited to include a plurality of major and minor struts, where the major struts are several times thicker than the minor struts. There is not even a suggestion of such a windowed support structure in the Mangat et al. disclosure.

With respect to applicants' amended independent Claims 54 and 55 which pertain to a temporary structure useful in fabrication of an electron beam lithography mask, these claims recite a plurality of windows which are filled by a support material. Due to the manner in which the Mangat et al. structure is fabricated, as described in Cols. 4, 5, and 6, as previously discussed, there is never a temporary structure which is a grid structure filled by a supporting material.

In view of the above distinctions, the Examiner is respectfully requested to withdraw the rejection of Claims 24 and 47 - 60 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5, 899,728 to Mangat et al.

Applicants contend that the presently pending claims are in condition for allowance, and the Examiner is respectfully requested to enter the present amendment and to pass the application to allowance.

The Examiner would like to discuss any of the claims, applicants' attorney is available and would appreciate the opportunity for such a discussion.

Respectfully submitted,



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